

are more reliable than the new," implying familiarity with both. One Buddhist headman earnestly sought of the field-worker information on medicines, or "mechanical devices" about which he had heard, but bemoaned the costliness. 842

To the concepts underlying childbirth, both as physiological processes and their meanings in Bang Chan's world view, we devote the next chapter. 128

7. Nauck (1956) finds that the number of pregnancies compared to the years of marriage is so low as to suggest (1) relatively low fertility in many cases, or (2) the existence of some (unknown) method of birth-control (pp.31-32). She finds an unusual feature of menstrual history as compared to western standards in a somewhat older age at menarche (median and modal age was 16, with a range from 13-19 years). The onset of menopause occurred anywhere from 35-55 or even later, which is somewhat later than in western societies (pp.30-31). (145) •

GENERAL DESCRIPTION OF FAMILY FARE IN BANG CHAN

261 As we turn to a detailed description of the family fare,
701 we should like to point out that starvation was unknown in
Bang Chan. Although much room remains for improvement in
731 diet, "hollow hunger" was uncommon. In the few times when
disastrous flood destroyed the year's crop, the government
was able to provide enough rice so that it need not be ra-
133 tioned. People still ate their fill. Even floods had their
226 advantage: one could fish out the window. That gross caloric
undernutrition was rare was borne out by examination of the
146 school children (Hauck, 1956). "On the average . . . Bang
145 Chan children could not be considered as markedly under-
weight. Few were so thin that one could 'count their ribs'
and still fewer would be considered plump by American
141 standards." In a random sample of village households that
included about 10% of the population, the heaviest man
weighed 69 kg. (151.8 pounds) and the heaviest woman 70 kg.
(154 pounds). We noted no more than half a dozen adults who
appeared to be "overweight." Most were middle aged or older,
and none of them did strenuous field work.

Sources of Food

Home Production, Storage and Preservation

262 Rice. - Rice is an essential part of any Thai meal.
256 The majority of the rice farmers in Bang Chan had rice for
251 home consumption milled for them at Minburi. In general,
they took their own paddy to the mill, and brought the re-
sulting milled rice home, where it was stored in a box or
mat-bin. Although, according to a recent survey (Goldsen and
Ralis, 1957) nearly a third of the households owned a home
rice mill, undermilled or home-pounded rice was not widely
[261] used in Bang Chan. Information on this point was obtained
for 333 of 336 "kitchen-unit"¹ households in the village. Of
these 5 consumed home-milled rice only, 51 used home-milled
rice in major part, 78 in minor part, and 199 not at all.

221 In households where home-milled rice was used, during
256 June enough would be pounded to last until harvest, at which
time hands were sore and bleeding from the field work and
home pounding was impossible. At the time when data for the
505 present report were being gathered, most families took paddy
256 to the mill when water in the canal was high enough so that
it could be transported by boat. If a farmer on a subsidiary

[252] 1. In some large houses, two related family groups
lived together but maintained separate kitchens.

A small, rather flavorless banana was given to young babies, sometimes before they were put to the breast. This type of banana and soupy rice were the only supplementary foods given before 6 months of age. Protein-rich foods, chiefly fish and egg, were generally introduced in small amounts during the second half of the first year. Few infants were given vegetables before one year of age, and even then none had them daily. At two years of age, some children had not yet been given green vegetables. Late introduction of vegetables into the child's diet may be due to the fact that vegetables were often prepared as hot curries which were considered unsuitable for young children. 853

A child was usually allowed foods commonly eaten by adults by the time he was weaned, although a few informants specified that the child could have anything but "hot tasting" foods, i.e. foods containing chili. A minority of informants mentioned other foods as not good for younger babies.

Except for dietary restrictions while the mother was lying by the fire, postpartum, no well established dietary taboos connected with the feeding of mothers or babies were encountered. The concept that a good choice of food is important to the health of both mother and child seemed to be entirely lacking. 846
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Many of the young children in Bang Chan failed to gain, or even lost, weight in the intervals between observations. Almost all infants appeared to gain steadily up to 6 months of age, but stationary weight or weight loss for periods of from 1 to 7 months was observed in most children at some time. These periods were noted more frequently among children from 2 to 3 years old than among younger ones. Such experiences were not more common after weaning than at other times, but the cause or causes of growth failure could not be determined from the information available. 145 •

Some approaches to improvement in the diet of Thai mothers and children are suggested. Improvement in the diets of mothers and small children would probably parallel any improvement in the general family dietary, since food is prepared at one time for all members of the family. 252

- 124 Information on growth in height and weight is based on obser-
125 vations of 71 children, most of whom were weighed and measured 6
or 7 times. For 30 of these children, observations were made
both before and after weaning.

HEALTH AND GENERAL CARE OF MOTHERS

- 145 Information obtained on menstrual history of girls and
women in Bang Chan has been reported previously (Hauck, 1956).
The median and modal reported age at menarche was 15 years with
a range from 13 to 19 years.

- 163 Most married women in Bang Chan had children, and of 438
pregnancies reported by 84 mothers, over 90 per cent resulted
in live births (Hauck, 1956).

843 Clinical History and Complaints During Pregnancy.

- 164 Most of the women interviewed reported no history of disease
which might affect, or be affected by, nutritional status.

Four women had a history of beriberi; 3, a history of
malaria; and one had active tuberculosis of which she later died.
In relation to the current pregnancy, 6 women had minor complaints
such as nausea in early pregnancy, faintness, and leg cramps.
The physician considered these as probably physiological. Of
the 4 women with more serious complaints, one who said she had
pain in the abdomen and legs and difficulty in walking had
manifest beriberi when seen a few days after delivery.

844 Delivery and Care of Mothers After Childbirth.

- 844 Information was obtained from 49 mothers concerning
125 delivery and care after childbirth. For 43 of these women,
ages reported were as follows:

<u>Reported Age</u> (years)	<u>Number of Mothers</u>
20 or under	7
21-25	11
26-30	12
31-35	6
36-40	6
over 41	1

The mothers interviewed had borne from 1 to 12 children.
For 8 of them, this was the first child; but 25, a majority,

GROWTH IN HEIGHT AND WEIGHT OF INFANTS AND YOUNG CHILDREN

- 145 Evidence on growth in height and weight of Thai is scant.
114 So far as we have been able to learn, all available studies
(21) have been cross-sectional. We, therefore, undertook, in the limited time available, to make longitudinal studies of growth of infants and small children and elementary school children in Bang Chan. Observations on the latter were summarized by Thorangkul (1957) and those of infants and small children, by Smith (1958).
- 145 In general Thai children of elementary school age are shorter and weigh less than Western children of the same age. Heights of children in the Bang Chan elementary school were, on the average, less than mean heights for Thai children given by Dr. Yong Chutima (1939), and they were much below mean heights at various ages from charts (class II) in use at the Department of School Hygiene, Bangkok. Mean heights of adult men and women in Bang Chan were slightly below those recorded by other observers who have measured groups of Thai men and women (Hauck, 1956). Without further study one cannot say whether the short stature of Thai as compared to Western peoples is due to inheritance, environment, or both. Nor do we know why school age children and adults in the rice producing village of Bang Chan were, on the average, somewhat shorter than their counterparts in Bangkok only 20 miles away.
- 121 Thorangkul (1957) found that although children 7 to 14
145 years of age increased in height in successive 3-month intervals, a large proportion of them failed to gain weight or even lost at times and that such failure to gain occurred in more children during the dry season than during the wet season. The reason for this was not apparent from our observations. Two possible explanations are: 1) use of untreated canal water may lead to heavier infestation with intestinal parasites in the dry season and 2) leafy vegetables are almost lacking, and other vegetables are in short supply at this time. One would expect the temporary shortage of vegetables to be reflected in growth failure only when the diet is borderline in respect to some nutrients as it appears to be in Bang Chan (Hauck et al., 1958; Hauck and Sudsaneh, 1959). Either of the possible causes suggested might affect the nutritional state of other family members as well as elementary school children. All those drinking canal water and eating "adult foods" could be affected directly, whereas infants who are still largely breast fed might be affected indirectly through the quantity and quality of mother's milk available to them.
- (22) In this section observations on the growth in height and weight of infants and small children in Bang Chan are presented.

Table 14. Ages of Infants and Young Children at First and Last Measurement¹, Bang Chan, Thailand, 1952-54.

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12	Age at First Measurement	Age at Last Measurement	Number of Children		
			Total	Boys	Girls
	months	months			
	under 1 ²	13-18	16	5	11
	1-3	16-31	12	8	4
	4-5	20-22	5	4	1
	7-9	23-27	4	2	2
	11-12	22-28	6	4	2
	13-18	29-35 ³	6	0	6
	19-24	36-40	10	3	7
	25-29	40-45	5	3	2
	31-35	42-51	4	4	0
	36-43	53-60	3	3	0
			71	36	35

1. In addition to these listed nine children were measured once or twice but were not followed longer.

2. Weights and recumbent lengths for infants under 1 month are not included in this report because of varying ages from one day onward, at which the initial observations were made.

3. Except for one child who was measured over a relatively short period.

125 asleep, and the mother was reluctant to wake him. Thus, for some children only three or four measurements were obtained.

The measurements of height and weight of each child were tabulated by age in months at observation.¹ A child was considered to be the age at his last month's birthday unless he was within 7 days of the next month's birthday. For example, a child who was measured at 3 months 25 days was considered to be 3 months of age, whereas a child who was measured at 2 months 20 days was considered to be 2 months old at the time of measuring.

Results.

- 145 Growth in Height and Weight Compared to Children Attending Well Baby Clinics. - The mean, median, and range of height and weight of children measured at 1 month, 3 months, 6 months, 9 months of age, and so on, were determined (Tables 16 and 17).¹
141 These figures include data obtained for all children who were measured at any of the selected ages but not weights and measures made at intervening ages. No marked difference was noted between mean and median values for height and weight. At almost all ages the mean and median values for height and weight of boys were greater than those for girls.

For comparison with these observations, only two reports on height and weight of Thai infants have come to our notice. Both of these dealt with infants and young children attending well baby clinics in Bangkok.

- 145 Over a period of 5 years, Dr. Montri Mongkolsamai (1939) collected data on height and weight of infants and children who came to the Well Baby Clinic at the Siriraj Hospital. These were described as normal children free from disease and ranging in age from 1 day to 6 years. Most of the children were Thai, most were from Bangkok, and most had been born in the Siriraj Hospital. In all, 2664 children were observed; 3006 measurements of height and 3570 measurements of weight were obtained.

Dr. Montri (1939) grouped the data according to age and sex, reporting mean values for height and weight of children under 1 year of age at monthly intervals and of children over 1 year of age at intervals of 6 months. For example, weights of all male infants who were 1 month old but younger than 2 months were averaged, also, weights of all male children who were 1 year old but younger than 1 1/2 years were averaged. Average weights and lengths of newborn infants and of infants under 1 month of age were included.

1. The height and weight of each child at each observation were reported by Smith (1958).

¹ [see p. 36-37 - Analysis]

Table 16. Mean, Median, and Range of Heights and Weights of Male Infants and Young Children Who Were Measured at Selected Ages, Bang Chan, Thailand, 1952-54.

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Age	No.	Height			Weight		
		Mean	Med.	Range	Mean	Med.	Range
		cm.	cm.	cm.	kg.	kg.	kg.
1 mo.	5	54.9	54.5	54.0-57.5	3.3	4.5	3.8- 5.25
3 mo.	9	59.4	59.5	49.5-64.5	6.1	5.5	5.0- 8.35
6 mo.	10 ¹	64.8	65.8	60.0-69.0	7.2	7.0	6.0- 8.5
9 mo.	10	68.2	68.3	65.0-73.0	7.6	7.5	6.9- 8.5
1 yr.	11	70.9	70.5	65.0-77.0	8.2	8.0	7.0-11.0
1 yr. 3 mo.	12	73.3	74.0	70.0-76.0	8.6	8.5	8.0- 9.75
1 yr. 6 mo.	9	76.7	76.5	74.0-80.0	9.3	9.0	8.0-10.5
1 yr. 9 mo.	6	79.0	80.3	73.5-81.0	9.7	9.8	7.5-11.0
2 yr.	6	79.1	80.3	74.5-82.5	10.1	10.5	8.0-11.5
2 yr. 3 mo.	5	81.3	82.0	76.0-85.0	11.2	12.0	8.5-13.5
2 yr. 6 mo.	3	84.0	83.5	80.5-88.0	10.7	11.0	10.0-11.0
2 yr. 9 mo.	3	86.2	85.5	84.0-89.0	11.2	11.5	10.0-12.0
3 yr.	7	87.9	87.5	85.0-92.0	12.0	12.0	10.5-13.5
3 yr. 3 mo.	6	88.0	87.8	85.0-92.5	12.0	11.8	11.0-13.75
3 yr. 6 mo.	7	89.8	89.5	87.0-95.0	12.5	12.5	11.0-14.5
3 yr. 9 mo.	4	92.3	92.5	90.0-94.0	12.9	13.0	12.0-13.5
4 yr.	3	94.0	94.5	91.5-96.0	14.2	14.5	13.0-15.0
4 yr. 3 mo.	4	95.9	95.5	93.5-99.0	14.8	15.0	13.0-16.0

1. An additional child was weighed but height was not measured.

145 Table 17. Mean, Median, and Range of Heights and Weights of
141 Female Infants and Young Children Who Were Measured
at Selected Ages, Bang Chan, Thailand, 1952-54.

Age	No.	Height			Weight		
		Mean	Med.	Range	Mean	Med.	Range
		cm.	cm.	cm.	kg.	kg.	kg.
1 mo.	9	53.1	52.0	49.0-59.0	3.9	3.75	3.35- 4.45
3 mo.	10	59.1	59.3	54.0-64.5	5.7	5.4	4.45- 7.0
6 mo.	9	62.8	62.5	57.5-69.0	6.6	6.5	4.8 - 8.0
9 mo.	11	65.3	64.5	58.0-73.0	7.0	7.0	5.35- 8.5
1 yr.	12	69.5	68.7	63.0-76.0	8.0	7.8	6.0 -11.0
1 yr. 3 mo.	11	72.1	71.0	68.0-80.5	8.2	7.5	7.0 -10.5
1 yr. 6 mo.	11	72.6	72.5	67.5-83.0	8.2	8.5	4.5 -11.0
1 yr. 9 mo.	7	77.6	75.0	74.0-86.5	9.7	9.0	8.0 -12.0
2 yr.	9	79.2	79.5	73.0-85.0	9.9	9.5	7.5 -13.0
2 yr. 3 mo.	8	78.4	78.3	74.0-82.5	9.3	9.5	7.5 -10.5
2 yr. 6 mo.	6	80.7	81.3	76.0-84.0	10.0	10.0	9.0 -11.0
2 yr. 9 mo.	6	83.4	83.0	78.5-88.0	11.3	11.8	9.7 -12.0
3 yr.	6	88.1	88.0	84.5-92.0	11.8	11.8	10.0 -14.0
3 yr. 3 mo.	3	87.3	86.5	85.0-90.5	11.5	11.5	11.0 -12.0
3 yr. 6 mo.	2	87.5	87.5	86.5-88.5	12.0	12.0	11.0 -13.0
3 yr. 9 mo.	1	87.5			14.0		

In some age groups fairly large numbers of children were observed and in other groups relatively few. None of the groups up to 4 1/2 years of age with whom the children in this series could be compared included fewer than 30 individuals. The numbers of boys and girls measured at each age were about the same. 145
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Dr. Amara Chandrapanond (1957) reported the mean heights and weights of 20 babies who were weighed and measured at monthly intervals over a period of a year. She did not report values for boys and girls separately, but, in general, at each age these fell between those for males and females as reported by Dr. Montri (1939). 145
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In figure 1¹ the median heights of boys and girls in Bang Chan together with the number of individuals who were measured at 3, 6, 9, 12, 15, 18, or 21 months are shown in comparison to the height curves constructed from values reported by Dr. Montri (1939). Corresponding median weights are shown in figure 2.² Although the groups are small, the tendency for both height and weight of young children in Bang Chan to be below that of children attending a well baby clinic in Bangkok is clear.

One should note, however, that Dr. Montri characterized the children he observed as "free from disease", whereas some of the children of Bang Chan had colds, skin infections, or other minor disorders which might have affected their weights. Such disorders are very common, and we do not know whether or not they disqualified children attending the Well Baby Clinic from inclusion in the series for which heights and weights were reported. [164]

Graphs of height-age and weight-age were plotted for each child in this study and for small groups of children who were observed regularly over a year or so at the same ages. [28]

Most of the children increased in height in a fairly regular fashion, the slopes of their height curves being about the same as the curve drawn from Dr. Montri's¹ values, although there were individual variations in this. The height curves of many more children of Bang Chan were below than were above the curve drawn to Dr. Montri's values. Of the 35 girls measured, the height curves of 6 were above, 6 were about the same as, and 23 were below the curve drawn to Dr. Montri's values for girls. Of the 36 boys measured, the height curves of 9 were

1. Mean values reported by Dr. Montri were plotted at 1-month intervals for the first 11 months, then at the midpoint of the intervals he reported. For example, measurements reported for children 1 to 1 1/2 years of age were plotted at 1 year 3 months.

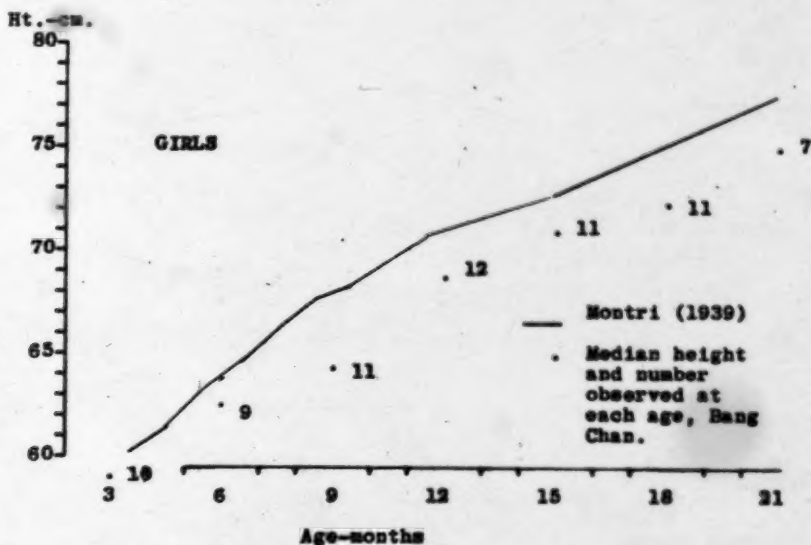
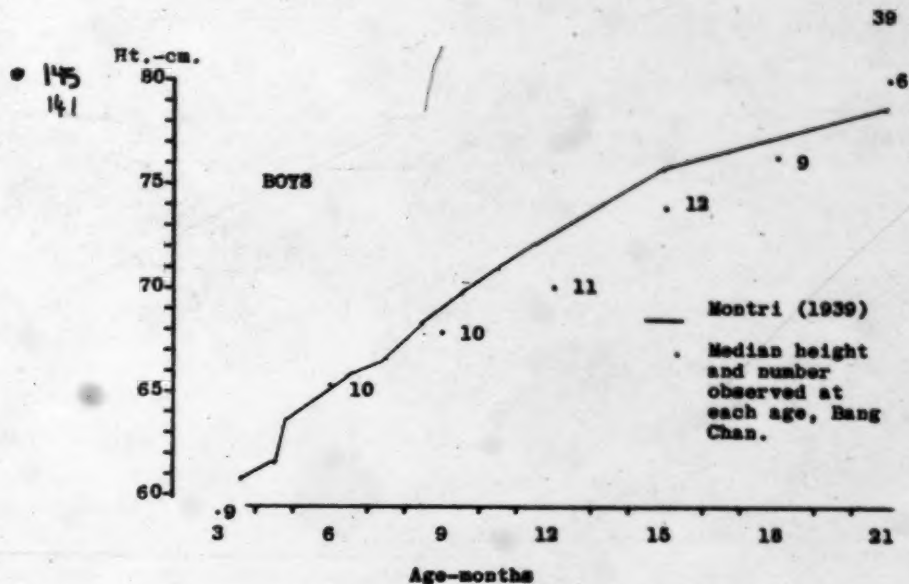


Figure 1. Median Heights of Children Under 2 Years of Age, Bang Chan, Compared to Mean for Children Attending Well Baby Clinic, Bangkok.

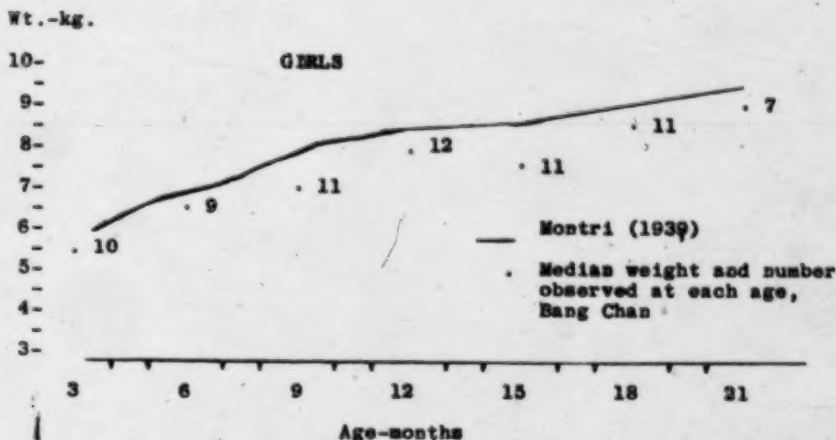
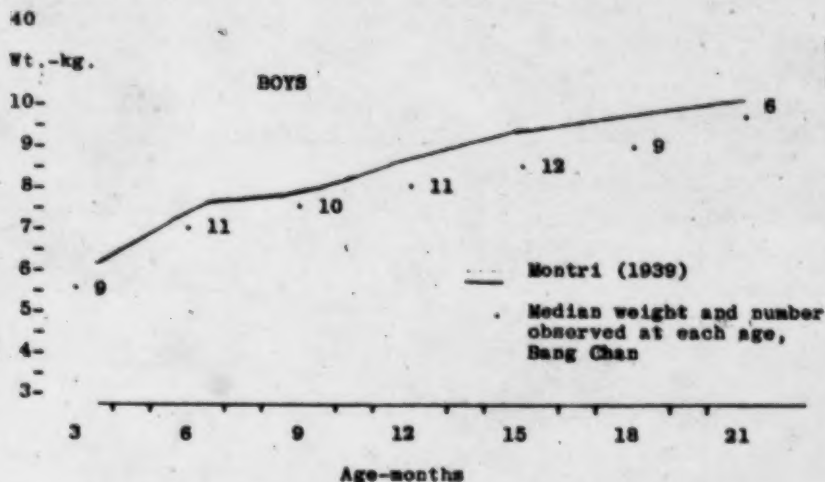


Figure 2. Median Weights of Children Under 2 Years of Age, Bang Chan, Compared With Mean for Children Attending Well Baby Clinic, Bangkok.

- 145 above, 12 were about the same as, and 15 were below the curve
141 drawn to Dr. Montri's values for boys.

[125] Mean heights and weights of groups of children who were observed regularly at 3-month intervals, at the same ages, were determined. The numbers in these groups were small because of difficulties encountered in collecting data precisely according to plan, but curves could be constructed for some such groups covering periods up to 12 months. These were compared to those based on Dr. Montri's values. The curves of mean height for such small groups were fairly smooth with slopes similar to but below the curve drawn to Dr. Montri's data.

For the younger groups of children in Bang Chan, curves for mean weights were generally below those drawn to Dr. Montri's values. Although the groups under 1 year of age were, on the average, about 1 week younger than the children observed by Dr. Montri, adjustment did not eradicate the difference. Differences between mean weights for groups of children 15 months of age and older, in this series and in Dr. Montri's, were less consistent than for the younger children.

145 Many studies on weight of infants in the tropics indicate that weight gain during the first 6 months or so of life is comparable to that of infants in Europe and America. After 6 months of age, however, the weight curves become flattened (Jelliffe, 1955; Falkner et al., 1958). Both Dr. Montri (1939) and Dr. Amara (1957) noted this tendency in the weights of the Thai infants they studied. Dr. Montri (1939) compared the weights of the Thai children he observed with values reported for Japanese children. He found that up to 6 months of age Thai children weighed as much as Japanese children but that after this age they weighed less. Dr. Amara (1957) compared the weights of the infants she observed with those of American babies and found that after 4 months of age the Thai infants gained weight more slowly. Both of these observers expressed the opinion that Thai babies gained weight more slowly as they grew older because their diets were inadequate.

145 In general, Thai children are short and light as compared
141 to children in the U.S.A. In the Bang Chan group, for example, at 3 and 6 months the median weights for male infants approximated the 25th percentile of male infants as reported by Stuart and Stevenson (1950). At 9 months, however, the median weight was

1. Dr. Montri calculated that boys 3 to 6 months old gained, on the average, 23 grams per day and that girls gained 22 grams per day; from 6 to 9 months the figures are 7.3 and 7.8; and from 9 to 12 months they are 7.4 and 7.6 grams, for boys and girls respectively. These values were calculated for a week and added to the mean weights of the children of Bang Chan to find out if the difference could be accounted for in this way.

42

about the same as the 3rd percentile of male infants in the U.S.A., and from one year on the values fell below the 3rd percentile. Norms for American children are inappropriate for use with Thai, but an increasing lag in growth such as we observed may be a matter for concern.

145 1 •
14

Weight Loss and Failure to Gain. - Many of the children in Bang Chan failed to gain or actually lost weight over periods of time. This occurred frequently between two weighings which were 1 to 4 months apart and occasionally when a child was reweighed after an interval of 6 months. In some children loss of weight or failure to gain extended over two weighing intervals. Such loss or failure to gain may be an important sign of malnutrition (Jelliffe, 1955).

145

[146]

Relation to age. - The ages at which the children experienced weight loss or failure to gain were determined by inspection of the weight-age graphs. As shown in Table 17, a period of loss of weight or stationary weight was noted for only one child below the age of 6 months. Between the ages of 6 and 12 months, a time when healthy infants usually continue to grow rapidly, such periods of weight loss or failure to gain for intervals of 1 to 5 months between weighings were observed in almost 40 per cent of the infants. Dr. Montri (1939) and Dr. Amara (1957) did not discuss the growth of individual infants, hence we do not know to what extent failure of some infants to gain weight may account for the depressed growth, on the average, which both of these observers reported for infants of this age.

During the second year of life children may be expected to gain weight less steadily, but more than 40 per cent of the children of this age in Bang Chan lost weight or failed to gain over intervals of 1 to 7 months.

After 2 years of age approximately one-half to two-thirds of the children weighed in a given 6-month period lost or failed to gain weight. Of 68 children who were weighed and measured over a period of a year or more, only 16 did not experience such loss or failure to gain between any two weighings. Most of these were in the youngest age group, only 3 were over 2 years old at the end of the study.

Possible reasons for failure to gain. - From the information available specific reasons cannot be given for the loss or failure to gain weight of so many of the young children of Bang Chan. Infection may have played a role, although we saw little evidence of severe infection and it was seldom mentioned. Increased activity as children grow older might affect rate of gain at the toddler age. For safety very young children in Bang Chan were closely tended which meant that their activities were rather restricted. As they became older and learned to

[147]

[148]

1 [See p. 37 - Analysis]

145 keep out of danger, they had more freedom. At this time their
[B59] caloric needs may have increased more rapidly than did their
caloric intake. To the student of nutrition, inadequate intake
of essential nutrients seems likely to be of importance when
children fail to gain.

[B62] In some areas growth failure is common at weaning, but this
did not seem to be a major factor in Bang Chan. Weaning before
one year of age was uncommon (Table 11, p. 24), yet growth
failure occurred in many infants between 6 and 12 months.

145 Observations on the weight gain of 30 children whom we
262 weighed both before and after weaning are summarized in Table
18. Four children lost or did not gain weight between the
weighing before weaning and the one afterward (code numbers 13,
23, 35, and 54), while 3 others, who had been weaned shortly
before a weighing, did not gain between the next two weighings
(code numbers 22, 33, and 37). Thus only 7 of 30 children lost
or failed to gain weight at or near the time of weaning (Table
18, I).¹

Weight curves of 4 children could not be interpreted in
relation to weaning. Two of these (code numbers 15 and 44)
were weaned just before their last weighing; for two others
(code numbers 18 and 51) the intervals between weighings were
long (Table 18, II).¹ Only 5 individuals gained at each succes-
sive observation (Table 18, III), whereas 18, a majority, failed
to gain at some period other than at weaning (Table 18, III and
individuals designated *).¹

Of 19 other children who had not been weaned by the time
the study ended, 10 lost weight or failed to gain at some
period during the study.¹

145 Since Thorangkul (1957) noted a clear association with
season of weight loss or failure to gain in Bang Chan school
children, the weight records of infants and young children were
inspected to see if such an association occurred at younger ages
also. The number of children weighed during each month and the
number who had lost weight or had failed to gain since the
previous weighing were counted after omitting observations on
children under 6 months of age, as well as those whose most
recent weighing had been obtained more than 4 months previously.
Little or no indication of relation of season to weight loss
or failure to gain was apparent. At the weighings in April,
July, August, and September, 1953, a smaller proportion of the
children had lost weight or failed to gain; but this is not

1. Of the 22 other children in the study, 20 had been breast
fed but were weaned before the study began, and 2 were receiving
cow's milk because of death or illness of their mothers.

Table 18. Observations on Weight Gain for Thirty Children Weighed Before and After Weaning.

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Sex and Code No.	Age at Observations	Age at Weaning	No. of Weighings		Comments on Weight
			Before Weaning	After Weaning	
	months	months			
I. INDIVIDUALS WHO LOST OR FAILED TO GAIN WEIGHT AT OR NEAR THE TIME OF WEANING.					
F 13	0-15	12½	6	1	L 12-15 ¹
M 23	2-19	14	3	3	NO 12-16
M 35	4-31	17	5	2	L 15-18
*M 56	20-37	25½	3	4	L25-38; L 31-37
*M 22	2-18	15	6	1	L 9-12; NO 15-18
M 33	4-22	12	3	4	L 12-16
*M 37	9-26	19	4	3	L 9-10½; NO 20-22; L 22-25
II. INDIVIDUALS WHOSE WEIGHT CURVES COULD NOT BE INTERPRETED IN RELATION TO WEANING.					
F 15	0-17	16	6	1	NO 14-17
M 18	0-18	12½	3	1	Not weighed between 5-18 months.
*F 44	16-29	28	5	1	L 16-17; NO 21-24; marked gain 27-29
F 51	18-35	18½	1	3	Not weighed 18-29
III. INDIVIDUALS WHO GAINED AT EACH SUCCESSIVE OBSERVATION.					
F 10	0-16	9	4	2	
M 19	1-17	13	5	2	
M 30	3-19	14	5	2	
M 42	11-37	19	3	3	
M 45	11-38	20	3	2	

* Individuals other than those in group IV, who lost or failed to gain weight at some period other than at weaning.

Table 18, con't.

145

Sex and Code No.	Age at Observations months	Age at Weaning months	No. of Weighings		Comments on Weight
			Before Weaning	After Weaning	
IV. INDIVIDUALS WHO FAILED TO GAIN AT SOME PERIOD OTHER THAN AT WEANING.					
M 4	0-15	10	5	2	NG 6-9
M 12	0-15	12½	6	1	NG 9-12; weaned right after 6th measurement; gain thereafter.
M 26	3-16	13	5	2	NG 5-6½ and 9-12
M 29	5-20	14½	3	3	L 10-14
F 31	3-21	18½	6	1	NG 6-9; L 12-15
M 32	4-21	18½	6	1	L 9-11
F 39	9-27	22	5	2	L 9½-12; NG 24-27
M 41	11-27	26½	5	2	NG 12-17
M 43	11-28	23	4	2	NG 18-21
F 46	12-22	18	2	2	NG 12-16; L 19-22
F 48	15-30	19	2	4	L 21-25
M 53	19-36	20	1	6	L 28-31
F 61	24-40	36	4	2	NG 24-27; NG 37-40
M 64	25-42	25	1	4	Weaned immediately after first weighing; large gain between 25-30 months; NG 39-42

1. L = Loss NG = No Gain Figures represent age in months.

clear evidence of a seasonal effect. If weight gain in Thai infants is related to season, this could be better defined by weighing groups of children at monthly intervals and determining when or if changes in rate of gain occur. 145 •

Although our records were not made for the purpose of correlating food intake with weight gain, and no quantitative information was obtained on the diets of mothers and babies, we attempted to see if any obvious relation existed between the variety of food eaten by the mother or the child and the child's growth. For this purpose, case studies were made of 7 infants whose records from birth onward were fairly complete. The age at last observation was from about 14 to 18 months. Four of these children had gained at each weighing and weighed more at one year of age than the average infant observed by Dr. Montri (1939). Three were chosen because they had lost weight or failed to gain at some time during the period of observation and weighed less at one year of age than the average infant observed by Dr. Montri. Infants of both sexes were included in each group. No illnesses or abnormalities were recorded in the clinical histories of any of these babies or their mothers. No evidence was obtained from the qualitative food records as to why some infants gained consistently and at a fairly "normal" rate, whereas others gained relatively slowly and failed to gain or lost weight at times (Smith, 1958). 145
262
[125]

Quantitative food records might have provided evidence on this point but our observations were inadequate for this purpose. Such quantitative records should include estimations of the amount of mother's milk obtained by the infants, based on the baby's weight before and after nursing, as well as records of supplementary food given. Analysis of the mother's milk, particularly for the content of the water soluble vitamins which are influenced by the mother's diet, should also help to shed light on the cause or causes of the common failure to gain weight among older infants and small children in Bang Chan. No cases of beriberi occurred among the infants we observed, but in two instances siblings had died of infantile beriberi. [164]
[165]

Evidence of protein malnutrition has not been commonly recognized in rice eating areas, but one must consider the possibility that these children may be in a state analogous to pre-kwashiorkor. Development of the clinically recognizable protein deficiency disease may be forestalled when the child learned to feed himself and eats more liberally of rice with some fish and egg. Of the 54 children with kwashiorkor observed by Netrasiri and Netrasiri (1955) in Bangkok, many were weaned earlier than was usual in Bang Chan. Most of them, however, had been breast fed, and 4 were still being breast fed when the disease was diagnosed. 121
[162]
[171]

145 In summary, although infants and children in Bang Chan
121 increased steadily in height, the rate of increase tended to
be less than that of infants observed in a well baby clinic in
Bangkok and much less than is usual for Western infants.
(146) Repeated periods of failure to gain in weight, or even weight
loss, which we observed in infants and small children as well
as in school children 7 to 14 years of age, may be evidence of
unsatisfactory nutrition and might account in large part for
the relatively small size of adults in this area. Extended
longitudinal studies on growth of Thai children are needed, as
are studies of food intake, intestinal parasitism, and other
conditions which may lead to growth failure. Controlled
therapeutic trials would help in recognizing the more serious of
many problems of child health in this region.

[p 48 is blank]

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Summary

12 The general condition of health and sanitation in the village of Bang Chan, Thailand, and the nutritional status of 166 persons in a random sample including 31 village households and of 233 primary school children are described.

141 The mean height for adult men in the random sample was 158.6 cm. (62.4 inches) and for women, was 151.3 cm. (59.6 inches).

Mean weights for adult men and women were 53 kg. (116.6 lb.) and 45.3 kg. (99.7 lb.) respectively. Mean and median weights for various age groups did not differ markedly nor consistently.

• 145 In general, the Thai children were shorter and weighed less than western children of the same ages. Mean heights and median weights fell below the 10th percentile of Iowa school children whose measurements have been reported by Stuart and Meredith (1946).

The reported age at menarche, for 94 females in Bang Chan, ranged from 13 to 19 years, with a median age of 15.

As judged by the median ages of eruption of specific permanent teeth and the number of permanent teeth per child at each age level, dental maturity of children in Bang Chan was approximately the same as that of children in other regions, both western and eastern, for which data are available. Although the average number of teeth at some ages was lower for children in Bang Chan than for American or English children, the differences were neither marked nor consistent.

164 Children in the Bang Chan primary school were found to be relatively free from caries. Of 226 school children 7 to 14 years of age, whose teeth were examined by a dentist, 42% were completely free of caries of both deciduous and permanent teeth. Of the total group of children, 68% (76% of 116 boys and 60% of 110 girls) were free of caries of permanent teeth. The average number of carious permanent teeth per child was 0.5 for boys and 0.9 for girls. For children with caries experience, the figures were 1.9 and 2.3 for boys and girls respectively. None of the children examined had any filled teeth.

The reason for the relatively low incidence of caries

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- 125 included adults of both sexes and some preschool children who were unwilling to allow the physician to examine them. The
123 small non-response group included persons of both sexes and a wide range of ages, and would therefore not be expected to bias the sample seriously. In general, rapport and cooperation were excellent.

Reproductive Function in Females

- [45] Information concerning menstrual history was obtained from girls and women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied (See Appendix A, schedule 3, item 35).

Information on child-bearing history was obtained from women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied (See Appendix A, schedule 3, item 36).

Illness and Injury

12 Evidence concerning the nature and extent of illness and
[164] injury in Bang Chan was obtained from various sources:

- 1) direct observation by the physician at the time of the physical examination, or when the physician was asked to visit a sick person in the village;
- 2) field notes in which information concerning illnesses, accidents and deaths were recorded as research workers learned of them; and
- 3) information obtained by structured interview in connection with surveys conducted by various persons working on the Cornell Thailand Project.

Adults in households which were included in the random sample were asked after the clinical examination whether any family member had been ill or injured during the past year. If so, the interviewer asked the nature of the illness or injury and what was done. The portion of schedule 6 which relates to this is included in Appendix A.

Some questions on illness were included in a survey of household heads in Hamlet KY-7 (Hanks, 1954) and in a structured interview to which there were 335 respondents from the

A [see pp. 51-52--Analyst]

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7

- 12 total of 336 households in Bang Chan (Ralis, 1955).¹ Appropriate portions of schedules used are included in Appendix A. A

Women in the random sample of village households, and women whose young children were included in the child feeding study, were asked about survival of all children born to them (See Appendix A, schedule 3, item 36). With the exception of a few old women, those who reported that one or more children had died, were asked to describe the child's symptoms and the circumstances surrounding the death. When the description was clear enough to permit diagnosis, the physician recorded cause of death, as well as the informant's description.

Sanitation

Information concerning toilet practices was obtained from adult members in 30 of the 31 families included in the random sample of households. Additional information on toilet care of infants and toilet behavior of preschool children was recorded in field notes.

In connection with a weighed dietary survey, the observers noted practices relating to care of food, disposal of garbage, and source and treatment of drinking water, in 11 households on 4 days each throughout a year.

Schedules or portions of schedules used in recording the information on sanitation are included in Appendix A.

ResultsPhysical Measurements

141
• 145 Heights and Weights. - Mean values and ranges for heights, cristal heights and bicristal diameters, and both mean and median values and ranges for weights of boys and girls in the Bang Chan primary school are classified by age,

[592] 1. In Ralis' survey, each "kitchen-unit" was considered as a household. As generally used in this data paper, "household" includes all persons living under one roof. A number of such households in Bang Chan include more than one kitchen-unit.

A
A [see pp. 51-52--Analyst]

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MI in Tables 1 and 2.¹ A

• 145

Heights of children in the Bang Chan elementary school were, on the average, less than mean heights for Thai children given by Yong Chutima (Chutima, 1939). They are much below the mean heights at various ages, from charts (Class II) in use at the Dept. of School Hygiene, Bangkok.² Curves for mean weights of children in Bang Chan cross Dr. Yong's average curves, but are well below the average curves for girls and boys in Class II, School Hygiene charts (Figures 1 and 2). When compared with mean weights for children of the same height and age, from tables in use at the Dept. of School Hygiene, however, the two curves are seen to be similar (Figure 3). Mean heights and weights for rural children as reported by Zimmerman (1931) are not very different from those in Bang Chan.

In general, Thai children are shorter and weigh less than western children of the same age. For example, at all ages, mean heights and median weights³ for both boys and girls in Bang Chan fell below the 10th percentile of the Iowa school children whose measurements are reported by Stuart and Meredith (1946) (Table 3).⁴ Weight of clothing was probably about the same for the two groups. In general, the median weight for a given age, in Bang Chan, corresponds to the weight of the 50th percentile for Iowa children 2½ to 4½ years younger. Thus the median weights for 8 year old boys and girls in Bang Chan, were similar to the weights of the 50th percentile of Iowa boys and girls 5 to 5½ years old, and the median weights of 13 year old boys and girls in Bang Chan were similar to weights of the 50th percentile of Iowa boys and girls at 10 and 9½ years of age, respectively. The tallest and heaviest boys and girls of these ages in Bang Chan were shorter and lighter than the corresponding median values for Iowa school children. On the average, however,

[128] 1. Median weights are generally considered to be more representative of a group, but mean values are included as well, for comparison with results of certain other studies.

[13] 2. Unpublished data, based on measurements of over 15,000 children, both urban and rural, made over a period of years, and compiled by Dr. Laeng. Furnished through the courtesy of Dr. Ladda of the Dept. of School Hygiene, Bangkok. Subjects were grouped as Classes I and II, of which roughly 1/3 were considered Class I.

3. Most of these observations were made in November or early December, 1952. On the basis of subsequent observations, many children were found to weigh less in May than during the previous February, but weight gains were again observed the following August and November.

TEXT CONTINUED ON PAGE 15]

A [see pp. 9-13-An] B [see p. 14-An]

Table 1

Heights, Weights, Cristal Heights and Bicristal Diameters
of 116 Male Children in Bang Chan Primary School, 1952-53, Classified by Age.

1 Age, Years	No. of Per- sons	Height		Weight ²			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
		<u>CM.</u>	<u>CM.</u>	<u>KG.</u>	<u>KG.</u>	<u>KG.</u>	<u>CM.</u>	<u>CM.</u>	<u>CM.</u>	<u>CM.</u>
7	5	111.5	106.5-114.0	18.1	18.75	15.5-19.25	64.0	60.5-67.5	19.3	18-20.5
8	19	113.6	106.0-123.5	19.5	19.75	16.0-23.0	64.4	59.5-70.0	19.5	18-20.5
9	9	115.8	109.0-124.5	20.0	19.50	16.5-25.25	66.3	61.5-73.5	19.4	18-22.0
10	22	121.9	113.5-130.75	22.7	22.25	18.0-29.0	70.1	62.0-76.5	20.2	19-22.0
11	24	125.0	116.0-132.5	23.8	23.75	19.0-30.0	72.9	63.5-80.0	20.7	18-23.0
12	18	125.2	119.5-141.0	26.2	25.25	22.0-34.0	76.3	68.5-87.0	21.2	18-24.0
13	18	138.9	126.5-151.5	31.8	32.75	23.0-41.75	82.3	74.5-94.0	23.2	21-25.5
14	1	131.5		29.0	29.00		76.0		22.0	

1. Age to nearest birthday. For 3 boys in the school, age was uncertain, therefore their measurements were excluded from these averages.

2. For children weighing 22.75 kg. or more, weight of clothing was about $\frac{1}{2}$ kg.; clothing of smaller children weighed less than this.

Table 2

Heights, Weights, Cristal Heights and Bicristal Diameters
of 109 Female Children in Bang Chan Primary School, 1952-53, Classified by Age.

Age ¹ , Years	No. of Per- sons	Height		Weight ²			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
		cm.	cm.	kg.	kg.	kg.	cm.	cm.	cm.	cm.
7	8	109.0	106.5-114.0	16.9	17.4	15.0-18.75	61.0	58.0-65.0	18.8	18.0-20.0
8	15	113.5	103.0-125.0	19.2	19.8	14.5-24.25	64.7	56.0-74.5	19.5	18.0-21.0
9	9	118.3	114.5-125.0	22.1	22.0	20.25-26.50	67.8	66.0-70.0	20.1	18.0-22.0
10	12	121.6	113.5-134.5	22.5	22.0	19.0-29.75	71.0	67.0-82.0	20.3	19.0-22.0
11	24	126.9	117.5-141.0	24.7	24.4	18.5-30.5	74.5	62.5-85.0	21.3	19.0-23.0
12	21	133.3	124.5-150.5	28.2	28.0	22.0-38.0	79.1	72.5-87.5	22.4	20.0-25.0
13	18	137.1	126.5-146.0	30.8	30.4	21.0-37.25	81.6	70.0-90.0	22.8	19.5-26.0
14	2	137.7	133.0-142.5	32.9	32.6	31.75-33.75	80.5	76.5-84.5	21.5	19.5-23.5

1. Age to nearest birthday. For 5 girls in the school age was uncertain, therefore their measurements were excluded from these averages.

2. For children weighing 22.75 kg. or more, weight of clothing was about $\frac{1}{2}$ kg.; clothing of smaller children weighed less than this.

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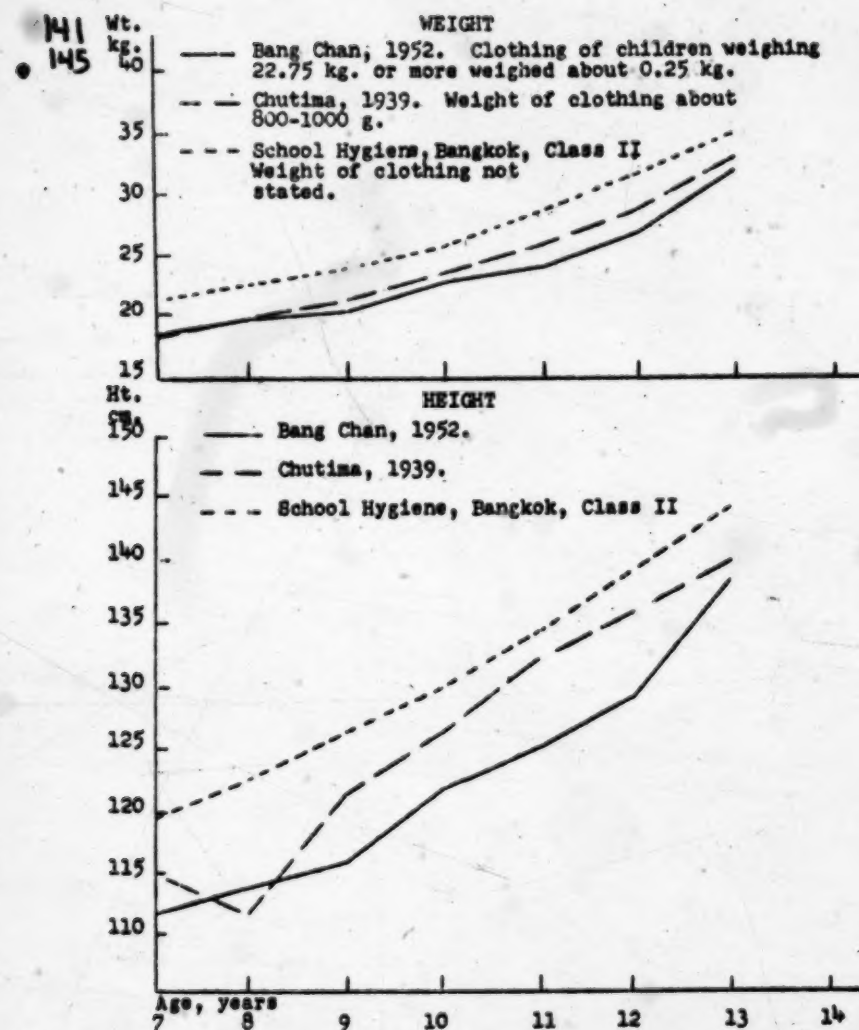


Figure 1. Mean heights and weights of boys in Bang Chan elementary school, compared with mean heights and weights of Thai children as reported by others.

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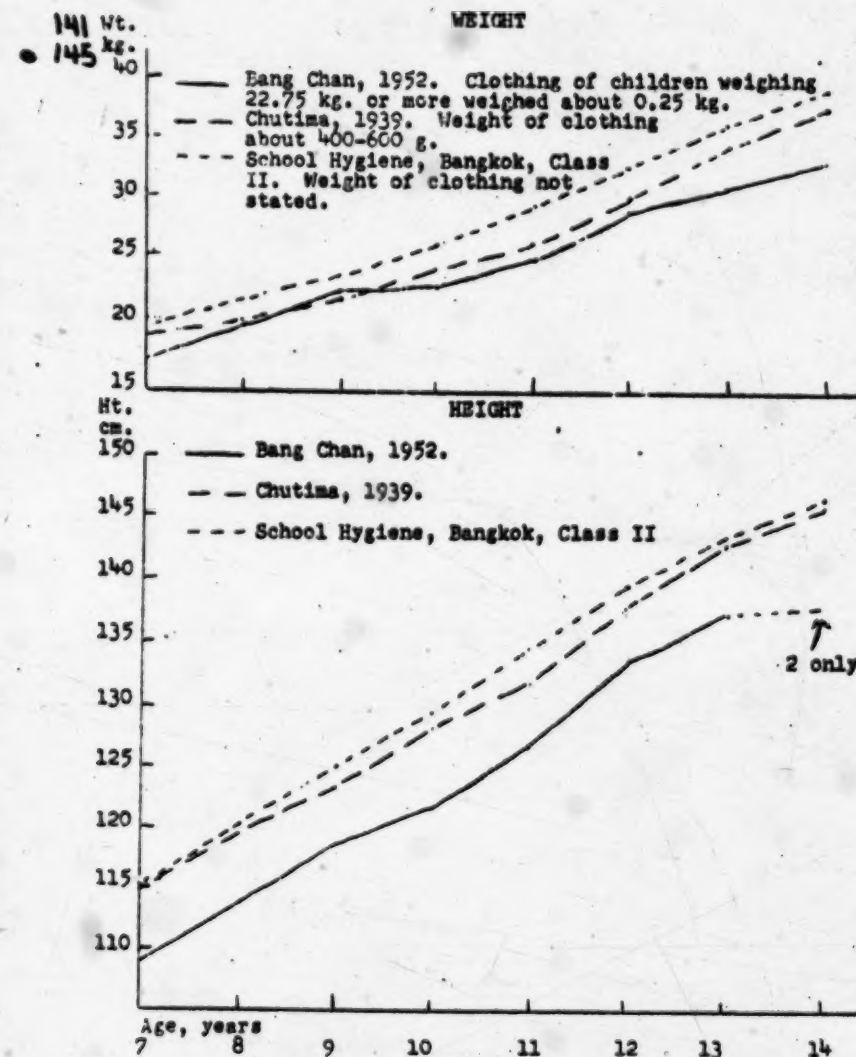


Figure 2. Mean heights and weights of girls in Bang Chan elementary school, compared with mean heights and weights of Thai children as reported by others.

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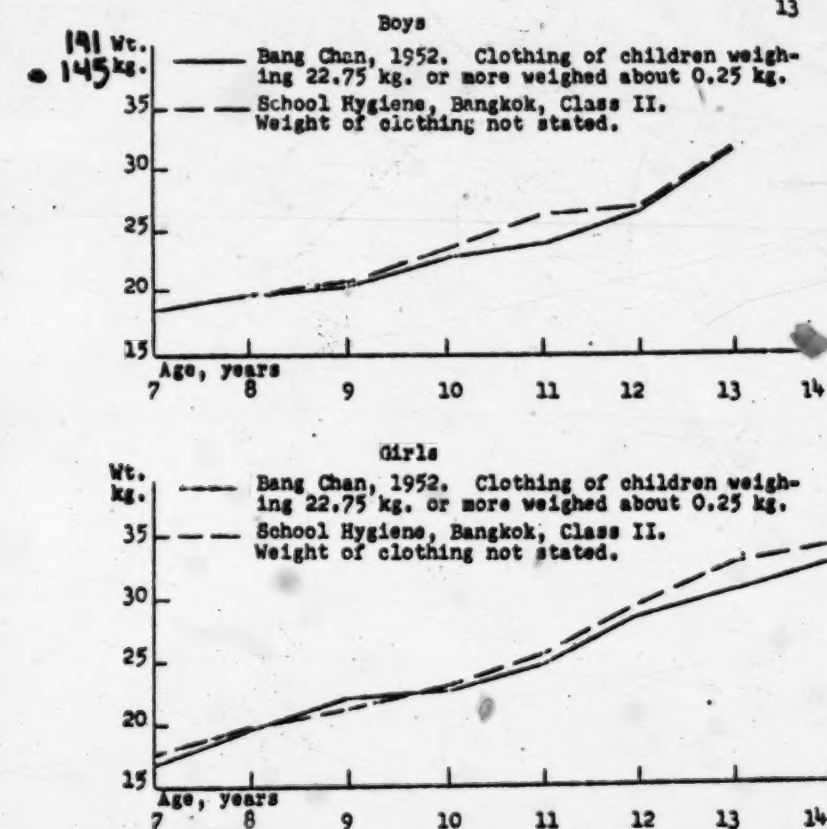


Figure 3. Mean weights of boys and girls in Bang Chan elementary school compared with mean weights (Class II) for children of the same height and age, in table used at Department of School Hygiene, Bangkok.

Table 3

Heights, Weights and Bicristal Diameters of Children in Bang Chan Elementary School,
Compared to Measurements of American School Children (Stuart and Meredith).

	Age ³	Bang Chan				Stuart and Meredith ¹		
		Height		Wt. ²	Bicr. diam.	Percentile 10		
		Mean	Range	Med.	Mean	Ht.	Wt. ⁴	Hip Width
Boys	8	113.6	106.0-123.5	19.75	19.5	123.1	23.2	19.2
	11	125.0	116.0-132.5	23.75	20.7	137.3	30.1	21.1
	12	129.2	119.5-141.0	25.25	21.2	142.4	32.7	21.9
	13	138.9	126.5-151.5	32.75	23.2	146.6	34.9	22.7
Girls	8	113.5	103.0-125.0	19.75	19.5	122.1	22.0	19.1
	11	126.9	117.5-141.0	24.4	21.3	137.0	28.4	21.4
	12	133.3	124.5-150.5	28.0	22.4	142.6	31.5	22.4
	13	137.1	126.5-146.0	30.4	22.8	149.1	36.2	23.6

1. H. C. Stuart and H. V. Meredith (1946).

2. Includes small amount of clothing, weighing on the average about $\frac{1}{2}$ kg. for the 11-13 year old children.

3. Ages 8, 11-13 chosen for comparison because for each age from 15-24 children of each sex had been measured.

4. Weight in pounds changed to kg. Children were weighed in light socks, shorts, and for older girls, brassieres.

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141 Bang Chan children could not be considered as markedly under-
 145 weight. Few were so thin that one could "count their ribs" and
 still fewer would be considered plump by American standards.

141 Heights and weights of males and females over 7 years of
 age¹ in the family survey are summarized in Tables 4 and 5.
 The height of the tallest man in the random sample was 172.5
 cm. (67.9 inches) and that of the shortest, 150.5 cm. (59.3
 inches). The height of the tallest woman measured was 159 cm.
 (62.6 inches), but one 16-year old girl, the daughter of the
 tallest man in the random sample, was taller, 161 cm. (63.4
 inches). The height of the shortest adult woman measured was
 142.5 cm. (56.1 inches). Mean heights for men and women 20 years
 of age or older, in the random sample were 158.6 cm. (62.4
 inches) and 151.3 cm. (59.6 inches) respectively.

The weight of the heaviest man in the random sample was
 69 kg. (151.8 pounds) and that of the heaviest woman was 70 kg.
 (154 pounds).

Mean weights for men and women in the random sample were
 53 kg. (116.6 pounds) and 45.3 kg. (99.7 pounds) respectively.
 Note that, in general, differences are slight between mean and
 median weights for age and sex groups including a number of
 individuals. The group of 6 men over 60 years of age is an
 exception, as values for two individuals weighing 66 and 69 kg.
 respectively raise the mean markedly. An even wider range of
 weights occurred in the group of women 60-81 years of age, but
 the influence of one high weight (70 kg.) was offset by a
 correspondingly low weight (27 kg.). Thus the tendency noted
 among western populations, for mean weight to exceed the median
 weight for a given age and sex group, was not apparent in the
 population of Bang Chan.

141 Girls in Bang Chan may have reached adult height and
 145 weight by age 20, since the small differences in the averages
 for ages 15-19 (mean age 17 years) and the successively older
 age groups are probably associated with individual variation
 and the small numbers in each group (Table 5).^A Note that, in
 general, Bang Chan women did not appear to increase in weight
 with age, after adult stature is reached. Zimmerman (1937)
 states that Thai females reach maturity of height at age 17.
 Mean values from School Hygiene tables are similar, for
 heights of school girls 17 or 18 years of age and older, and
 mean weight increases from 17 years on are in the neighborhood
 of 1 or 2 kg. Mean heights for adult women in the random
 sample of households in Bang Chan are slightly below those re-
 corded by other observers (Table 6).^A

1. Measurements of preschool children are included in
 Appendix B, Table 19.

^A[see p. 17-An]

^B[see p. 18-An]

^C[see p. 67-an]

Table 4

Summary of Heights, Weights¹, Cristal Heights and Bicristal Diameters of 62 Males Over 7 Years Old, in the Random Sample of Village Households, Bang Chan, 1952-53

Age	No. of Persons	Height		Weight ¹			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
		CM.	CM.	KG.	KG.	KG.	CM.	CM.	CM.	CM.
8	1	112.0		17.5	17.5		64.0		18.5	
9	1	113.5		19.5	19.5		63.0		20.0	
10	3	121.7	120.5-122.5	23.4	23.5	22.25-24.5	69.7	68.5-70.5	20.0	19-21
11	2	129.5	129.0-130.0	26.3	26.3	25.0-27.5	77.0	75.0-79.0	21.5	21-22
12	5	130.8	119.5-137.5	27.3	28.3	22.0-31.0	77.3	69.5-84.5	20.8	18-23
13	2	145.8	140.5-151.0	35.8	35.8	33.25-38.25	86.3	82.0-90.5	25.0	25-25
14	2	149.0	145.0-153.0	38.0	38.0	34.0-42.0	85.5	85.0-86.0	22.5	22-23
15-19	9	153.8	141.5-167.0	45.1	45.8	35.75-53.25	91.4	82.5-101.0	25.4	24-27
20-39	20	157.5	152.0-171.0	51.8	52.0	42.5-58.5	91.4	86.5-99.0	26.5 ²	24-28
40-59	11	160.6	151.5-172.5	54.9	55.0	45.5-61.0	93.1	86.0-101.5	27.7	24-29
60-66	6	158.0	150.5-170.5	53.4	49.8	43.0-69.0	91.6	86.0-101.0	27.9 ²	25-30
Partial Total 20-66	37	158.6	150.5-172.5	53.0	52.0	42.5-69.0	91.9	86.0-101.5	27.1	24-30

1. For children weighing 22.75 kg. or more weight of clothing was about 0.25 kg., clothing of smaller school children weighed less than this. Clothing of adults weighed about 0.25 kg.

2. Measurement was not obtained for 1 person in this group.

Table 5

Summary of Heights, Weights¹, Cristal Heights and Bicristal Diameters of 70 Females Over 7 Years Old, in the Random Sample of Village Households, Bang Chan, 1952-53

Age in Years	No. of Persons	Height		Weight ¹			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
8	4	112.4	100.0-117.0	18.2	19.6	13.0-20.5	63.1	56.0-66.0	19.4	18.0-20.5
10	4	124.0	120.0-126.5	24.1	23.6	19.75-29.5	71.9	67.5-75.0	19.8	18.0-21.0
11	2	122.3	120.0-124.5	23.1	23.1	22.0-24.25	71.5	69.0-74.0	21.0	20.5-21.5
12	3	135.3	127.0-140.5	29.7	30.5	27.75-30.75	79.0	75.5-81.0	22.0	21.0-23.0
13	3	142.0	138.5-145.5	34.9	36.0	32.25-36.5	85.8	84.5-87.5	21.7	21.0-23.0
14	1	142.5		33.8	33.8		84.5		19.5	
15-19	8	151.3	143.5-161.0	45.4	45.5	40.0-50.5	90.0	85.0-96.0	25.8	23.0-27.0
20-39	21	150.1	142.5-158.0	45.9	47.0	32.5-58.0	87.2	81.5-96.5	26.3 ²	22.0-31.0
40-59	16	150.3 ²	143.5-157.0	44.0	43.0	37.0-55.5	87.8	78.0-93.5	26.9	23.0-29.5
60-81	8	151.4	146.0-159.0	46.0 ²	46.3	27.0-70.0	88.1 ²	84.0-93.0	28.0 ²	24.0-30.0
Partial Total 20-81	45	151.3	142.5-159.0	45.3	45.7	27.0-70.0	87.6	78.0-96.5	26.7	22.0-31.0

1. For children weighing 22.75 kg. or more weight of clothing was about 0.25 kg; clothing of smaller school children weighed less than this. Clothing of adults weighed about 0.25 kg.

2. Measurement not obtained for one person in this group.

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141 Among the men and boys in the random sample of house-
 145 holds, however, mean height and weight were distinctly less
 for the age group 15-19 (mean age 17) than for the older age
 groups (Table 4). Mean height and weight increased with
 age among the subgroups. Thus mean height of 4 boys 18 and 19
 years old was 157.6 cm., and mean weight 50.2 kg. as compared
 to 150.1 cm. and 38.5 kg. for 4 boys aged 15-16. Among the 20
 men in age group 20-39, 3 were age 20, and 4 either 23 or 24.
 Mean heights for both of these subgroups were 157 cms. The
 number of young men examined in Bang Chan is too small to
 permit judgment as to when adult stature is attained. On the
 basis of measurements of Siamese males, from the medical ser-
 vice of the Royal Siamese Navy, Dr. Yong concludes that
 "growth, as regards both height and weight stops at age 22"
 (Gautam, 1937). According to Siamensis (1927) such Siamese
 boys increase in height steadily until about 19 years of age,
 at which time they seem to have reached maturity. Adult men
 in Bang Chan were on the average a little shorter than other
 groups of Thai men whose measurements were available to us
 (Table 7).

Bicristal Diameter. - Some additional information con-
 cerning body build is obtained from this measurement. In
 general, for Bang Chan children of elementary school age
 (Tables 1 and 3), mean bicristal diameters correspond to hip
 widths for Iowa school children one to three years younger
 (Stuart and Meredith, 1946). Mean bicristal diameters of
 adult men and women in Bang Chan (Tables 4 and 5) correspond
 approximately to the values for the 10th percentile of the 18
 year old boys and girls in the Iowa study. Andrews (1943)
 found the hip breadth of Central Thai men to be 26.98 ± 1.48
 cm., which is similar to the mean of 26.9 cm. for 31 adult
 males, aged 20-59, in Bang Chan.

141 Cristal Height. - At the time this study was undertaken,
 145 the Committee on Anthropometry of the Food and Nutrition
 Board, National Research Council had tentatively recommended
 125 cristal height as an additional measurement pertaining to the
 long dimension of the body. Mean values and ranges, for
 various age groups, are presented in Tables 1, 2, 4 and 5.

Dental Status

144 A dentist examined the teeth and mouths of 226 school
 125 children, 7 to 14 years of age, in good natural light, using
 mouth mirror and probe. Teeth of persons in the random sample
 of village households were inspected by the physician in the
 course of the clinical examination. Data on dentition and
 dental health were analysed by Kamalanathan (1956).

000 As noted by the Joint FAO/WHO Expert Committee on

[TEXT CONTINUED ON PAGE 21]

AB425 [see p.: 16; 20; 9-13; 16, 17; 9-13, 16, 17]

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As noted by the Joint FAO/WHO
Expert Committee on

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146 Nutrition (1951) the part played by diet in the production of teeth which are unduly susceptible to caries is still controversial, although in general, the importance of nutrition, especially in the formative period, is widely accepted. In accordance with the recommendation of this Committee, caries rates are recorded as a separate item, and are not taken as a criterion of malnutrition.

125 **145** **Dentition.** - Median ages of eruption of specific permanent teeth in 240 Bang Chan children, ages 7 to 14, are shown in Table 20 (Appendix B). For this purpose, data on 226 children in the Bang Chan primary school, and 14 additional children between those ages, in the random sample, were included. The percentage of boys and girls at each age, having each specific tooth erupted, was calculated. Median ages of eruption were estimated according to the method suggested by Klein et al. (1937). A graph was drawn for each kind of tooth, for each sex. Cumulated percentages for each specified kind of tooth erupted were represented on the y axis and age in years at one year intervals on the x axis. Median age of eruption was estimated by determining the point at which the age percentage eruption curve cut the 50% perpendicular.

145 In Bang Chan, as elsewhere, the median age of eruption for specific teeth is lower for girls than for boys. In some cases the difference is slight, in others, from several months to more than a year. The difference is most marked for lower canine teeth.

The average number of teeth, deciduous, permanent and total, at each age, is shown for children 7 to 14 years of age, in Table 21 (Appendix B). For ages 8 to 13, the greater dental maturity of girls than boys is reflected in the larger average number of permanent teeth present at each age.

On the basis of median ages of eruption for specific teeth, and the number of permanent teeth per child at each age level, dental maturity of children in Bang Chan appeared to be approximately the same as for children in other regions, in both eastern and western hemispheres, with which they were compared. Although the average number of teeth at some ages was lower for children in Bang Chan than for American or English children, the differences were neither marked nor consistent (Kamalanathan, 1956).

144 **Caries Incidence.** - Caries incidence was found to be low among Bang Chan children as compared to many regions in which surveys have been made. Of 226 children examined by the dentist, 42% (45% of the boys and 38% of the girls) were totally free of caries. When all carious teeth, both deciduous and permanent, were included, the average number of carious teeth per child was 1.8 (1.6 for boys and 2.0 for girls).

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164 Considering deciduous tooth only, in a group of 173 children, 93 boys and 80 girls who had deciduous teeth, 56% of the boys and 50% of the girls were free from caries. The average number of carious deciduous teeth per child was 1.4 and 1.5 for boys and girls respectively. For those with caries experience, the number of carious deciduous teeth per child was 3.2 for both boys and girls.

In the entire group of 226 children, 76% of 116 boys and 60% of 110 girls were free from caries of permanent teeth. The average number of carious permanent teeth per child was 0.5 for boys and 0.9 for girls. For children with caries experience, the figures were 1.9 and 2.3 for boys and girls respectively. None of the 30 boys with caries of permanent teeth had more than 4 such teeth, whereas 5 of 43 girls had more than 4 carious permanent teeth.

164 Data for children aged 12 to 14 in Galesburg, Illinois and Colorado Springs (Dean et al. 1942) have been chosen for comparison of caries experience in permanent teeth, with that in Bang Chan. In these cities, the fluoride content of the water is conducive to low caries incidence, yet the percentage of children aged 12 to 14 having caries experience was 72.2 and 71.5 for Galesburg and Colorado Springs, respectively as compared to 41% for Bang Chan, and the number of DMF¹ permanent teeth per child was 2.36 and 2.46 as compared to 0.88 carious permanent teeth per child in Bang Chan.

171 The reason for the relatively low incidence of caries among children in Bang Chan cannot be stated with certainty. Similarly low or even lower caries incidence has been reported for certain age groups of children in various parts of the world, for example in North China (Afonsky, 1951), in the northern islands of Samoa where the people had little access to store foods (Losee, 1952) and in a small isolated village in Greece (Phillipas, 1955). One thing which residents of Bang Chan appeared to have in common with such other populations which are relatively caries free, was low intake of sugar², particularly in a form which would be apt to adhere to the teeth.

757 Restoration of Decayed and Missing Teeth. - None of the children examined had any filled teeth. Up to 44 years of age, the adults examined had retained almost all of their teeth, and no evidence of restoration, other than crowning was noted. Decline in average number of teeth was marked after age 55.

• [145] Of 92 adults with teeth, at least 7 men and 6 women had been to a dentist as evidenced by the presence of crowned teeth

1. DMF denotes decayed, missing and filled. Children in Bang Chan had no filled teeth.

2. Sudsaneh (1956) found the average per capita intake of sugar in 11 families to be only 6 grams per day.

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141 pictured as bowlegged in Chutima's report (1939) are, however, clearly so, and represent more extreme cases than we encountered among the children in Bang Chan in 1952-53. If the incidence of bowleggedness among children in Thailand is indeed decreasing, an investigation into possible causes of the change would be of interest.

142 To the nutrition specialist on the team, who was not Thai, the knee joints appeared to be large. Moreover, although the term "knock knees" was not included on the schedule, it was entered frequently by the physician under comments (Appendix B, Table 22). Whether this condition is related to heredity, nutritional status, or to some other environmental influence such as the life-time habit of squatting on the heels, is not known.

143 The physician's estimate of general appearance and vitality were recorded early in the examination, before he sought for specific signs. About 80% of all persons examined were rated as "good," and less than 1% as "poor." About half of all persons rated as "good" in general appearance and vitality were without clinical signs, as compared to about 30% of those rated "fair." Of persons with 3 or more possible signs of malnutrition, however, about 2/3 were rated "good" (Appendix B, Tables 23 and 24). As has been observed frequently, such a general appraisal is not correlated with the presence or absence of clinical signs possibly associated with malnutrition. Clearly, in Bang Chan, there is little or no malnutrition of the sort that causes marked apathy.

In summary, a variety of possible signs of malnutrition were noted both in the school children and the persons in the random sample of village households. More than half of the total number examined had one or more signs possibly due to malnutrition, but the only clearly defined deficiency disease encountered was one case of beriberi in a 49-year old man.

Reproductive Function in Females

144 Menstrual History. - Information concerning menstrual history was obtained from girls and women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied.

145 Most of the women from whom information on age at menarche was obtained were under 40 years of age. A few could

146 1. History of beriberi among nursing mothers and their infants was obtained in several instances, and cases of beriberi, in both sexes, were seen among persons not included in the population samples which were examined.

2 [see p. 71-Am]

3 [see p. 72, 73-Analyt]

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145 not recall the age at menarche.

The median and modal reported age at menarche was 15 years, with a range from 13-19 years (Table 11).

Table 11

Reported Age at Menarche of 94 Females in Bang Chan.

	Age in Years						
	13	14	15	16	17	18	19
Number at each age	6	18	34	21	8	4	3
Percentage at each age	6	19	36	22	9	4	3

This estimate, made from ages given by recall, is necessarily approximate; however, none of the girls between 12 and 14 who were examined clinically, had passed the menarche. Moreover, median and modal ages at menarche were 15 years for sub-groups aged 15 to 24, and 25 to 39 at the time of inquiry, hence the inclusion in this series of women for whom the event was not recent did not alter the estimated median age at menarche. Wilson and Sutherland (1953) conclude that in tropical countries the onset of menstruation as compared with that for English children, may be either early or late. Tanner (1955) notes that if climate has an effect on age at menarche, it must be a minor one, and that at present the effect of race cannot be disentangled from nutritional and socio-economic circumstances. Basing his judgment on the effects on man of famine associated with war, and on results of direct experiments on animals, Tanner expresses the conviction that nutrition plays a major role in determining the age at which menarche and the adolescent spurt in growth occur. If this view is correct, the relatively late median age of menarche in Bang Chan may be associated with inferior nutritional status.

145 One of 17 women in the age group 35-44 had passed the menopause, whereas 12 of 16 women over 45 years of age had done so. One of 7 women over 55 years of age, 2 of 7 women age 50-54, and one of 2 women age 45-49 had not yet reached the menopause. The reported ages at menopause were: 30-34 years, 2 women; 40-44 years, 3 women; 45-49 years, 3 women and 50-54, 5 women.

147 Approximately 100 respondents gave information concerning

Appendix B

Table 19

141 Summary of Heights and Weights¹ of 34 Pre-school Children in
 145 the Random Sample of Village Households, Bang Chan, 1952-53

Age	No. of Persons	Height		Weight		
		Mean	Range	Mean	Median	Range
		cm.	cm.	kg.	kg.	kg.
<u>Males</u> <u>No.</u>						
Under 1	2	50.8	50.0-51.5	3.4	3.4	2.95-3.8
5-6	1	61.0		5.5	5.5	
11-12	1	69.0		8.3	8.3	
<u>Years</u>						
1-1 $\frac{1}{2}$	4	68.5	65.0-70.0	8.3	8.1	7.0 -10.0
2	1	89.0		13.0	13.0	
3-3 $\frac{1}{2}$	3	86.7	83.5-90.0	11.2	10.5	10.0 -13.0
4-4 $\frac{1}{2}$	4	96.5	90.5-104.5	14.2	14.0	12.75-16.25
4 $\frac{1}{2}$ -5	1	98.5		12.5	12.5	
6	2	105.0	101.5-108.5	17.0	17.0	16.5 -17.5
<u>Females</u> <u>No.</u>						
1	1	63.0		5.2	5.2	
3	1	54.0		5.5	5.5	
7	1	63.0		5.5	5.5	
9	1	60.5		6.3	6.3	
11-12	1	70.0		7.5	7.5	
<u>Years</u>						
1 $\frac{1}{2}$ -2	2	73.3	71.0-75.5	9.3	9.3	9.3 - 9.3
2 $\frac{1}{2}$ -3	2	81.5	81.0-82.0	10.5	10.5	10.0 -11.0
3 $\frac{1}{2}$ -4	3	85.5	85.0-86.0	11.7	12.0	10.5 -12.5
4 $\frac{1}{2}$ -5	1	94.5		12.5	12.5	
6	1	108.0		18.5	18.5	
7	1	107.5		17.5	17.5	

1. Preschool children were weighed nude.

Table 20

• 145 Estimated Median Ages of Eruption of Specific Permanent Teeth in Children of Bang Chan¹

Tooth	Jaw	Side	Boys		Girls	
			Age of Eruption		Age of Eruption	
			Each Side	Average	Each Side	Average
			<u>Years</u>	<u>Years</u>	<u>Years</u>	<u>Years</u>
1. Central Incisor	Upper	Right	8.0	8.1	7.7	7.8
		Left	8.2		7.8	
	Lower	Right	7.0- ²	7.0-	7.0	7.0-
		Left	7.2		7.0-	
2. Lateral Incisors	Upper	Right	9.2	9.1	8.6	8.8
		Left	8.9		9.0	
	Lower	Right	8.2	8.2	7.6	7.6
		Left	8.1		7.6	
3. Canine	Upper	Right	11.4	11.5	11.0	10.9
		Left	11.6		10.8	
	Lower	Right	11.3	11.3	9.9	9.9
		Left	11.2		9.9	
4. 1st Bicuspid	Upper	Right	10.4	10.5	9.7	9.8
		Left	10.6		9.9	
	Lower	Right	11.0	11.1	10.4	10.4
		Left	11.1		10.4	
5. 2nd Bicuspid	Upper	Right	11.9	11.9	11.6	11.6
		Left	11.8		11.5	
	Lower	Right	11.8	11.8	11.5	11.5
		Left	11.7		11.5	
6. 1st Molar	Upper	Right)	7.0-	7.0-	7.0-	7.0-
	Lower	Left)				
7. 2nd Molar	Upper	Right	12.2	12.2	12.1	12.1
		Left	12.1		12.0	
	Lower	Right	11.5	11.7	11.5	11.6
		Left	11.8		11.6	

1. Adapted from Kamalanathan, 1956.

2. 7.0- More than 50% of 7 year old children had this tooth erupted, hence the age of eruption is given as less than 7.0.

Table 21

• **145** Average Number of Teeth: Deciduous, Permanent, and Total, at Each Age, in Children 7 to 14 Years of Age, Bang Chan¹.

Age, years	Boys				Girls			
	Number Examined	Average No. Teeth			Number Examined	Average No. Teeth		
		Dec.	Perm.	Total		Dec.	Perm.	Total
7	5	15.0	6.4	21.4	8	17.3	5.5	22.8
8	18	14.9	7.8	22.7	16	14.5	9.0	23.5
9	9	12.4	10.6	23.0	8	12.0	10.8	22.8
10	23	9.5	14.8	24.3	13	6.3	17.6	23.9
11 ²	27	6.8	17.9	24.7	24	4.6	19.8	24.4
12 ²	23	4.2	21.9	26.1	20	3.0	22.6	25.6
13 ²	17	0.5	26.3	26.8	22	0.7	27.4	28.1
14	3	0.0	28.0	28.0	4	0.0	28.0	28.0

1. Adapted from tables in Kamalanathan, 1956.

2. Six children in the age groups 11 to 13 had one or more 3rd molars erupted.